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ABSTRACT

A project was conducted to develop an articulated technology education curriculum for middle school/junior high school, high school, and teacher education levels in Kansas, based on the successful program developed at Pittsburg Middle School, Pittsburg, Kansas. Through a series of two-day meetings, a task force developed a rationale, basic definitions, program assumptions, typical technological concepts (content identifiers), an articulated program model, and a plan of action for developing, field-testing, evaluating, and implementing technology education in Kansas. As a result of the project, technological concepts were written, guidelines and technical assistance were provided, teacher education programs were conducted, and a plan for continual evaluation and upgrading was implemented. Each module of the delivery system was to include problem-solving opportunities, examples of technological impacts (social, political, consumer, educational, occupational, and environmental), and creativity. A program model was developed that can be adapted to various school situations. (KC)

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TECHNOLOGY EDUCATION:
A KANSAS CURRICULUM DEVELOPMENT PROJECT

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TECHNOLOGY EDUCATION: A KANSAS CURRICULUM
DEVELOPMENT PROJECT

The Rationale

The world has made a sudden and dramatic shift from an industrial society to a super-industrial, informational, technological society. These two eras differ profoundly and all aspects of society are affected. Just as the agrarian society was replaced by an industrial society, the industrial era is being rapidly replaced by a technological one. Each change created significant discontinuities. It is important to note, however, that the previous shifts were spread over generations even centuries, whereas, the present process of change is occurring in a few decades. Disruptions in life styles, political organizations, occupations and the meaning of work, educational systems, and economics occur and will continue to occur because of this pervasive force--technology.

All segments of our society, and of most societies in the world, are experiencing these discontinuities. The business world has recognized that we have a world economy rather than a national economy. Industry has seen other countries surge ahead in areas of production where the United States once reigned supreme. Public mass-education institutions served us well during the industrial era but now fail to meet the needs and expectations of an informational age. Communications technology affords immediate news of occurrences around the world and even has the capability of allowing the masses to respond to those happenings. Increasingly these and other issues are technology based and technologically critical.

Education has a responsibility to address these changing conditions by developing technological literacy. The literature justifies technology education.

> Technology and technological development affect every aspect of our society--on a local, state, national, and international level.
>
> Economic, technological, and educational developments are closely and inherently related.
>
> The United States competes economically with other technologically developing countries.
>
> The United States' educational supremacy is being lost to other countries.
>
> The United States' technological supremacy is threatened.

Technology has created a dichotomy in the work force.

High technology occupations require a higher level of education than industrial occupations of the past.

The role of elementary and secondary educational institutions is to prepare youth for functional living in a technological world.

These observations illustrate the need for technology education; the development of technological literacy. It has been suggested that literacy is considerably more than what the back-to-basics advocates are promoting. In an article in the *Kappan* in 1983, Richard Hersh stated that "in the post-industrial age, the difference between the haves and have-nots will be measured in terms of technological literacy."

Technological literacy includes the ability:

1. to apply scientific and mathematical knowledge,
2. to engage in complex thinking,
3. to understand technological innovation and the productivity of technology,
4. to comprehend the impacts of the products of technology on the quality of life, and
5. to make critical evaluation of societal matters involving the consequences of technology.

Schools throughout the nation have been struggling with ways of developing this technological literacy. Industrial arts professionals have claimed this objective for many years and have been actively seeking methods of accomplishment. Many models now exist. The Pittsburg Middle School of Pittsburg, KS has become a focal point for many in the United States, and some other countries, who are interested in seeing technology education in operation. This program, conceived and developed by Mike Neden and Max Lundquest, had its first full year of operation in 1986-87. The development and operational procedures of that program are briefly described in the video tape *One Step Beyond*.

During the fall semester of 1986, as Mike, Max and I were writing a grant proposal and planning workshops for the summer of 1987 to introduce Kansas industrial arts teachers to the concepts, philosophy, and methods of their *Explorations in Technology* program, we decided the model was worthy of expansion to high school and teacher education programs. Among the many considerations for this decision were,

* Schools are searching for viable technology education models;

* Pittsburg Middle School has an outstanding technology education program which, is based on solid educational principles, functions extremely well, and is sought after by numerous schools;
* The model is flexible, expandable, and exportable;
* The modular delivery system, a modified *Occupational Versatility* student management system, is adaptable to any school size and facility;
* The state of Kansas needs a comprehensive, articulated technology education program.

We prepared and submitted a proposal which was funded by the State Department of Education, Vocational Education Division. The grant was for a Technology Education Curriculum Development Project Task Force. Our purpose was to plan a process for developing a curriculum through which an articulated technology education program could be delivered--a comprehensive plan for developing technology education curriculums for the middle-school/junior-high school, high-school, and teacher-education levels of Kansas.

The Task Force

The task force was composed of the three co-directors-- Mike, Max, and me--and a representative from each of the following:

* Middle School Industrial Arts Teacher
* High School Industrial Arts Teacher
* Industrial Arts Teacher Educator
* School Administrator (Principal or Superintendent)
* Local School District Supervisor
* State Department of Education.

The Task Force, through a series of two-day meetings hammered out a rationale, basic definitions, program assumptions, typical technological concepts (content identifiers), an articulated program model, and a plan of action for developing, field-testing, evaluating, and implementing technology education in Kansas.

The Curriculum Project Plan

As we engaged the process of developing a plan, there were a few unwritten but understood operational assumptions.

* THIS IS AN OPERATIONAL MODEL RATHER THAN A RESEARCH MODEL
* THE MODEL IS TO BE EMULATED RATHER THAN DICTATED
* THE RESULT IS NOT A CURRICULUM GUIDE TO BE SHELVED AWAY

Purpose of the Project

The purpose of the project was to develop and field test a model program of technology education--a program which could be implemented in the schools of Kansas and the nation. The scope of the program is middle-school articulated through high-school and teacher education. A program to be designed, field-tested, and refined so that other schools will want to implement technology education.

Definitions. For purposes of project planning the following definitions of terms were agreed upon.

Technology. Technology is the application of knowledge toward useful purpose. Stated in reverse, it is the useful application of knowledge.

Technology Education. Technology education is the development of technological literacy.

Technological Literacy. Technological literacy is the technological knowledge which all citizens must have to function effectively in tomorrow's world. It is that knowledge of practice which enables one to make meaningful decisions about the use of technology, to use technical terms with understanding, to make enlightened choices about products, occupations, and practices which affect their lives and the lives of others.

Assumptions

The Technology Education Curriculum Development Task Force established assumptions essential to the concept and method of this proposed project. These assumptions guide the development and operation of the project and implementation of the Technology Education model. These are listed without priority.

* All education is for the future and the future is a technological, informational world.
* Technology Education is general education, serving all students regardless of ability or career interests.
* The Technology Education program will be for all students on an elective basis from middle-school through high-school with a focus through the 10th grade allowing individual studies and specialization at the 11th and 12th grades.

* The program will be sufficiently broad and flexible to meet the needs of any community--large or small, urban or rural.

* Content of the program will be drawn from current and emerging technologies which are of importance to all students regardless of career choices.

* Technology Education is to develop the technological knowledge which all youth need to function in tomorrow's world.

* The learning method is activity centered so that students experience the technology and develop positive concepts which enables them to make intelligent and meaningful decisions about the use, value, problems, and control of technology.

* Flexibility is the key to success in a technology education curriculum--flexibility in content, activities, student ability and interest, laboratory size and configuration, equipment and tools, school organization, and number of teachers.

  The content of **Technology Education** programs must be capable of continuous upgrading and change to reflect the accelerative nature of technology.

  Teachers must be able to accept and promote change so that students recognize that change is necessary and can learn to control it.

  Facilities must be flexible enabling the addition, temporary substitution, and/or deletion of content and activities.

  Learning activities must allow for modification, addition, or deletion to reflect changing technology, learning styles of students, available facilities, and the interests and abilities of students.

  The delivery system must permit individualism, self-pacing, simple to complex levels, discrete or continuous units, differing learning styles, freedom from teacher weaknesses, use of instructional technologies, and expandability.

  Programs must accommodate various school sizes and different organizational patterns.

Industrial arts teachers and programs are the most logical means by which to deliver technology education in the Kansas schools.

* The curriculum must be interdisciplinary in nature and concern without limiting modifiers which relegate it to some preconceived niche in the total school program.

* Technological concepts/activities will be organized in a modular manner allowing schools to select among many to fit the program to their situation. High-school modules may vary in breadth and will have greater depth than those for middle-school.

Project Outcomes

The outcomes of the project are relatively simple yet significant in the process of expanding technological literacy in the State of Kansas. These anticipated outcomes are:

* Identification of technological concepts

* Learning modules of selected technological concepts
* Demonstration sites to field test modules

* Guidelines and technical assistance

* Teacher education programs

* A plan for continual evaluation and upgrading

Project Strategy

The strategies of the project build upon and include the work done by the Technology Education Curriculum Task Force. These are rather unsophisticated and straightforward; action modeled rather than a research modeled. Although sixty-one major steps were identified and included in five schemes:

* Preproject and Project Startup
* Management
* Curriculum
  * content identification and selection
  * module writing and testing
  * demonstration site selection and development
  * faculty training and development
  * teacher education site development
  * facility planning and development
  * evaluation of all curricular elements.
* Evaluation
* Implementation.
  * the application procedure,

* facility planning,
* equipment selection,
* funding strategies,
* planning assistance,
* teacher education, and
* program monitoring.

Content

The Task Force spent time identifying content for technology education programs. It recognized, however, that within the time-frame an exhaustive study was not possible. So, criteria for the selection and characteristics of developed modules were initiated and a listing of typical technologies was made. It had been agreed previously that the delivery system would be modular. Each module/unit was to include,

* problem solving opportunities
* examples of technological impacts
  - social
  - political
  - consumer
  - educational
  - occupational
  - environmental
* creativity.

Criteria for Selection. Although we accepted that further refinement will occur when the curriculum development project is underway, some basic criteria were created to guide subsequent actions. These are in question form.

* Is it of value to the general public?
* Is it fundamental to contemporary technology?
* Is it realistically possible considering:
  - cost
  - student interest
  - instructional soundness?

Technological Concepts or *Technology Stuff*. With a premeditated effort to avoid grouping the technology concepts in any cluster classification, the Task Force identified a number of items called Technology Stuff. Because technology is not limited to industrial activity and because of its dynamic nature and because it is not possible to explore much less learn all of technology, we chose not to categorize. This provides greater flexibility for schools and teachers and becomes a challenge to identify more.

Aerospace	Air Conditioning	Alternate Energy
Audio Communications	Automotive Technology	Automation
Ceramics	Chemical Technology	Composites

Computer Applications	Construction	Drafting
Desktop Publishing	Electricity	Electronics
Fiber Optics	Flight	Futurism
Holography	Hydraulics	Engines
Lasers	Management Systems	Manufacturing
Marketing Technology	Mass Transit	Measurement
Mechanical Systems	Medical Technology	Metals
NC/CNC	Photography	Plastics
Pneumatics	Printing	Production
Refrigeration	Research & Design	Robotics
Rocketry/Spaceflight	Technological Impacts	Transportation
Telecommunications	Visual Communications	Wood Technology

The list can be endless as new developments occur and as subtopics are extracted from larger ones on the list. It is then the task of applying the criteria and making priorities according to local conditions. The intent is to explore as much of the important technology as possible within the time available. Breadth takes precedence over depth.

The program model is shown on the following sheet. This model provides maximum flexibility in program offerings and student selection. It is adaptable to small school situations as well as large schools. It can acclimate to schools with vocational educational programs, Principles of Technology, college preparation, or specialized offerings in more traditional industrial arts. The latter should be considered only when ample evidence exists that a broad spectrum of the student body is being appropriately served. A unique feature, perhaps the most unique feature, of this technology education curriculum model is that it can be modified without upsetting the other elements and within each area each module can be changed or activities within modules can be altered without disrupting any others. New technology can be added or better learning activities can be designed and implemented on a continuing basis. That's technology education!